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one leg on any of the main divisions shown on the square in this scale, and the other leg on the tenth subdivision. This division, pricked off from the centre line on the timber on each side, will give the points for the gauge-lines. Gauge from the corners both ways, and the lines for making the timber octagonal in its section are obtained. Always take the same number of spaces on your compasses as the timber is inches square from the centre line. Thus, if a stick is twelve inches square, take twelve spaces on the compasses; if only six inches square, take six spaces on the compasses, etc., etc.

Fig. 3 shows how a common rafter can be laid out, and the proper angles or levels obtained, by a practical application of the square. Avoid lining for a "lookout;" give ample length for projection. Take pitch of roof on tongue, and half the width of building on blade; the angle along edge of blade then, is the bevel of foot of rafter; the "lookout" or projection must be provided for independent of the actual length of the rafter. Run the square along the rafter as many times as there are feet in half the width of building.

To find the hypotenuse when the base and altitude are given: let a equal altitude, b the base, then $a^2 + b^2 = g^2$ the hypotenuse, etc. This is the rule on which the foregoing is based. Braces of different runs may also be found by the use of the square as above, under the principles contained in the rule. A full explanation of the use of the square for getting rafters and braces under the above rule, can be found in the *American Builder* for 1876.

Fig. 4 shows how an octagon can be produced by the aid of a steel square. Prick off the distance $a o$ equal to half the distance of the square; mark this distance on the blade of the square from b to o , place the square on the diagonal, as shown, and square over each way. Do the same at every angle, and the octagon is complete.

To obtain the same figure with the compasses, proceed as follows: Take half the diagonal on the compasses, make a little over a quarter sweep from c , and at the intersection at d and c , then d and c form one side of an octagonal figure.

Again: take a piece of timber twelve inches square, as Fig. 5; take twelve inches on the blade from a to b , mark at the point a , operate similarly on the opposite edge, and the marked points will be guides for gauge-lines for the angles forming an octagon. The remaining three sides of the timber can be treated in the same manner.

These points can be found with a carpenter's rule as follows: Lay the rule on the timber, partly opened, as shown in the cut, "prick off" at the figures 7 and 17 as at a and b ,

and these points will be the guides for the gauge-lines. The same points can be found by laying the square diagonally across the timber and "pricking" off 7 and 17.

To make a moulder's flask octagonal proceed as follows: The flask to be four feet across. Multiply 4×5 (as an octagon is always as 5 to 12 nearly), which gives 20; divide by 12, which gives $1\frac{2}{3}$ feet, cut mitre to suit this measurement, nail into corners of square box, and you have an octagon flask at once.

Another method of constructing an octagon is shown at Fig. 6. Take the side as $a b$ for a radius, describe an arc cutting the diagonal at d ; square over from d to e , and the point e will then be the gauge-guide for all the sides.

Another method (Fig. 7) is to draw a straight line, $c b$, any length; then let $a b$ and $a c$ be corresponding figures on the blade and tongue of the square, mark along either and measure the distance of required octagon; move the square and mark also. Now use the square the same as before, and the marks $c b$ and $b d$ are the points required.

If these explanations are not sufficiently clear to the reader, the writer will be pleased to answer any questions regarding them that may be asked through the Question columns of the WOOD-WORKER.

Hand-Railing.

BY W. H. COOKEN.

FROM B, Fig. 1, Plate 82, square from B C draw B A extended and equal to $1\frac{1}{2}$ risers marked "floor;" produce A B to F and set up the number of risers from "floor," viz. 6; square over at 6 for tread of pitch-board and gauge from rake of pitch-board one half thickness of rail, placing gauge-mark fair to centre of baluster at 6; draw pitch as shown to B C at C; on A as centre with required centre radius of small circle of plan, strike arc seen at G, draw G C touching arc; draw A S parallel to G C; through A square from G C draw G H; extend curve E B to J, and make J H, J I each equal to one half width of rail; draw N B parallel to G C; make G M equal to B F and connect N M, produce the short lines Q (q) and R are parallel to M C one half width of rail distant therefrom. K H and I L are parallel to N B. Now draw N O C, Fig. 2, any length, and make O N equal to same letters at Fig. 1, square over N B equal to same letters, Fig. 2; square over O D equal to A S, Fig. 1; connect B D extended, B V being straight shank as required; make O P E P equal to A P E P, Fig. 1; draw P R M Q parallel to O C and equal to O R M Q, Fig. 1. Draw on each side of E one half width of rail and spring line B O. Stand on O as centre and take a

radius touching B D as shown by arc, shift to A, Fig. 1, and intersect at V, then V and M show bevels for upper and lower ends of wreath respectively. V W equals V; extend to cut W, Fig. 1, and W, Fig. 2 is set one half width of rail away from S V. Now, put in curves, which will be readily understood, as O Q, O R, Fig. 1, are the focal radii to get points for pins for smaller curve, and O L, O K the focal radii for large curve pins.

Correspondence.

WE invite communications from our readers in matters connected with the trades we represent. Be brief, courteous, and to the point.

Editor of the Wood-Worker:

SOME time ago I sent a query to the WOOD-WORKER asking if any one of its readers had been able to execute a wreath as laid down in Plate 10 of Mr. Gould's book, the "American Stairbuilder's Guide." Answer No. 43 in August number of the WOOD-WORKER has opened the way for exposing the utter worthlessness of the book. I send you by this mail a drawing of the correct solution of the problem Mr. Gould has so befogged in his book. I look upon the "American Stairbuilder's Guide" as a cruel imposition on the novice into whose hands it might fall, and I rejoice to know that there is a means of showing up this humbug work through the columns of the WOOD-WORKER, and thus prevent many young workmen from being victimized through the errors that abound all through the work. I find that, with the single exception of Plate 2, and where the elevation tangents have the same pitch, not one of the elliptical curves are correct, and so great is the variation that at Plates 3 and 5 the centres, *c* of Fig. 3, should be respectively $3\frac{1}{2}$ and 4 inches (!) removed toward the assumed focal points 3. But this error of putting in the curves might be passed over, as it would not entail a loss of labor on the wreaths, other things being correct; the more serious error, however, of taking the wrong bevels, which would entail a great loss of labor and material, cannot be so easily condoned. On Plate 21 a wrong bevel is given for Fig. 3, so also at Plates 22 and 29, and the false bevels given are of such a nature as to lead to disappointment, confusion, and loss. Let any stairbuilder examine Plate 14, where the bevel is given correctly, and compare it with Plate 21, Fig. 3; in both cases the conditions are the same, yet the methods for the bevels are very different. Can both be right? Now, in order for any one having this book to prove whether or not what I have said is true, let him use the blocks as advised in the book in question, fit to the plan and cut to the pitch of tangents, and he will soon discover the "rottenness in

Denmark." In conclusion, if "Bevel" will execute a wreath according to my drawing on Plate 82 of present number, which is suitable to the conditions of Plate 10 of Mr. Gould's work, he will have no trouble in arriving at a satisfactory result.

When a true method is adopted in determining lines for hand-railing, but little trouble arises, but there are so many "quack" works on the art afloat in the country that the young mechanic is liable to be deceived and discouraged at every turn. It was not "Bevel's" dulness to comprehend that caused his failure, but the false teaching and empiricism of the author of "Gould's American Stairbuilder's Guide."

W. H. COOKEN.

ORILLIA, ONT., Aug. 30, 1879.

Editor of the Wood-Worker:

I BECAME so befogged in the early chapters on the "Sectorian System of Hand-Railing," that I got disgusted with myself and the system, and finally gave it up. Have many of your subscribers mastered the method; if so, I would like to know? I was very much interested in Mr. Riddell's "Lessons on Projection," but there are some things in them that I do not understand. On page 140 there is a method described by him for getting out wreath-pieces, but I utterly failed to discover how the upper end is connected with the rise, and also to find the long diameter. I failed also to find where the angle of long diameter is located. Neither can I see how the short diameter is obtained, or how the angles from lower end to top of rail are described. While I would be glad to have these "points" fully explained, I acknowledge I have no claims either on you or Mr. Riddell to furnish me or other subscribers with brains. It seems to me that possibly Mr. Riddell has supposed the reader to have some knowledge of the subject in question, or that his lessons are so simple that but little explanation is thought necessary. I have copied, cut, and folded the lesson referred to, as directed, but still fail to thoroughly comprehend. If not asking too much, will you kindly give "more light" on the subject?

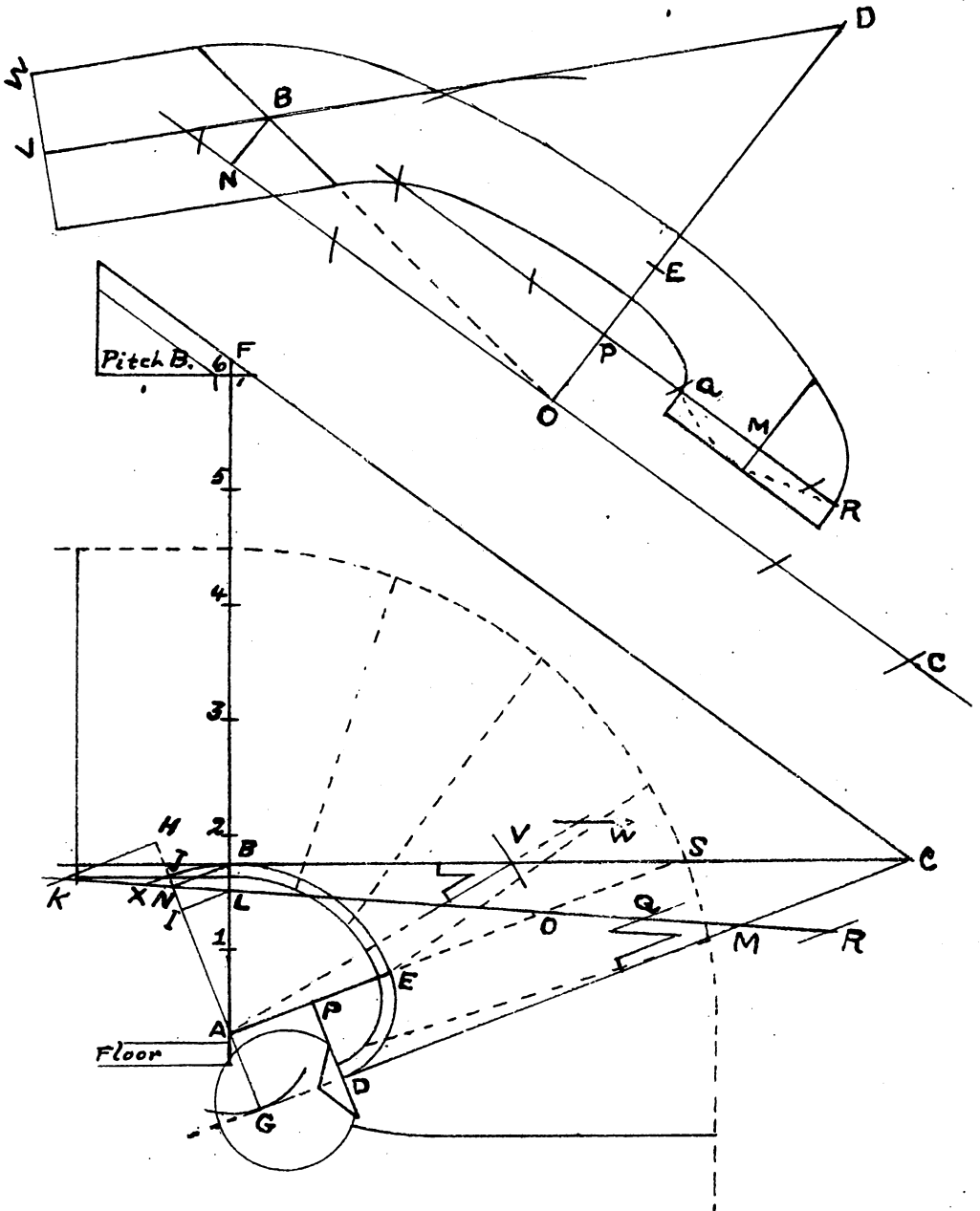
P. S.

FULTON, N. Y., Oct. 6, 1879.

Intercommunication.

THIS department is intended to furnish, for the benefit of all our readers, practical information regarding the art of manipulating wood by hand or machinery, and we trust that every reader of our paper will make the fullest use of it, both in asking and answering. All persons possessing additional or more correct information than that which is given relating to the queries published, are cordially invited to forward it to us for publication. All questions will be numbered, and in replying it will be absolutely necessary, in order to secure due insertion, that the NUMBER and TITLE of the question answered should be given; and in sending questions, the title of key-words of the question should be placed at the head of the paper. Correspondents should in all cases send their addresses, not necessa-

PLATE 82.



HAND-RAILING.